Qube Lite: Expanding Access to Emissions Monitoring

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Our Sponsor
• Qube Technologies is a Calgary-based environmental tech company that develop low-cost emissions monitoring devices aimed at helping primary industries, such as oil and gas, detect, quantify, and reduce methane and other greenhouse gases.

Project Motivation
• Qube currently deploys Axon devices, a device that monitors for harmful gas leaks and displays all the emission data on their online dashboard.
• To address the demand emissions monitoring device suitable for smaller sites, remote locations, challenging conditions such as Class 1 Division 1 areas, the Qube Lite was conceived.

Our Solution
Our tailored solution for the Qube Lite prototype incudes:
• Develop an efficient power supply architecture to maximize battery longevity and solar panel recharging functionality that can operate in Class 1 Division 1 areas.
• Using a low energy consumption microcontroller, configure a methane sensor to operate continuously and accurately.
• Established satellite communication for reliable data transfer to the Cloud with regular data transmissions of 5–10 minute intervals.
• Design a PCB that can encompass all the hardware that is responsible for the functionalities listed above.

Key Components
RedBoard Artemis Nano
GlobalStar SmartOne Solar: Solar Panel and Modem
NevadaNano Methane Sensor

Prototype Testing
Main components of Power Supply:
• Power Supply Board Output: Varied tests confirmed voltage and current outputs within expected ranges.
• Charge Pump Circuit: Achieved stable 3.3V output under different loads, confirming the circuit’s effectiveness.
• OR-ring Circuit: Verified no reverse current and proper voltage output.

Data Transmission has also been tested:
• Satellite Data Transfer: Tested SmartOne Solar panel/modem for functionality in both indoor and outdoor settings to ensure reliable satellite data transfer.
• Sensor Data Acquisition: Configured and validated Nevada Nano methane sensor readings through the Artemis Nano board using Arduino IDE.
• Email Payloads: Implemented email messaging as a medium for receiving sensor data payloads.
• Data Visualization and Analysis: Transformed raw sensor data payloads from emails into accessible, user-friendly readings on the Ubidots platform.

Created Flow Diagrams and Block Diagrams as well as learned necessary software to be used in the project, eg. Altium

Finalized Power Supply Schematic and Established UART communication between the SmartOne Solar, NevadaNano sensor, and Artemis Nano

Soldered main components together and tested functionalities